

Invasion Pathway Analysis and Genetic Screening Tool Development

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Keywords: invasive species, ballast water, genetics

The number of invasive species in Region 10 estuaries, including Puget Sound, Coos Bay, and Prince William Sound, is rising. San Francisco Bay, widely considered the most highly invaded estuary in North America, is suspected of being a local source pool for secondary invasions of other U.S. West coast estuaries. EPA Regions 9 (San Francisco), and 10(Seattle) are attempting to identify and characterize invasion pathways along the West Coast by testing the hypothesis that some populations of invasive species distributed across Pacific estuaries are actually derived from San Francisco Bay populations, as opposed to coming directly from overseas, and that ballast water from coastal shipping traffic is an important vehicle in this spread. Patterns of genetic diversity are being evaluated by sampling invasive populations of eight exotic species from California to Alaska. Molecular genetic screening tools are also being developed to determine whether these species are being carried in ballast water, particularly as originating from San Francisco Bay. Characterizing invasion pathways and transport profiles will support federal and state early detection and monitoring programs, and will improve ballast water best management practices designed to eliminate or restrict the spread of invasive species across West Coast estuaries. Results from the proposed research will likely also effect ballast water regulation development. Current ballast management programs focus on international shipping, but confirmation that there is organism exchange among west coast estuaries, and that San Francisco is a local exporter of exotic species to other Pacific estuaries, would call for development of stronger interstate and coastal ballast water regulations. Ballast water enforcement is also currently very difficult and problematic. A molecular screening tool designed to identify exotic species in ballast water will provide a comparatively rapid and powerful method for verifying whether vessels have complied with open-ocean ballast exchange requirements. Such a tool will be a significant advancement beyond current methods that have either limited detection capability or are more time-consuming to implement.